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EFFICIENCY OF RADIOFREQUENCY ASSISTED UVULOPALATOPHARYNGOPLASTY IN THE TREATMENT OF SNORING

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SUMMARY – Snoring is an acoustic phenomenon, which is a consequence of vibrations of the soft tissue caused by partial obstruction of the upper breathing pathway while sleeping. It is estimated that 20% of men and 5% of women between 30 and 35 years of age snore and this rate increases to 50% of men and 30% of women over 60 years of age. The aim of this study was to evaluate the efficiency of radiofrequency assisted uvulopalatopharyngoplasty in the treatment of snoring by comparing snoring index and other polysomnography values before and after surgical treatment. The study included 22 patients (men 87% and women 13%), mean age 43.09±9.6 (range, 28-67) years, treated for obstructive sleep apnea syndrome at University Department of ENT and Head and Neck Surgery, Sestre milosrdnice University Hospital Center, Zagreb, during a 2-year period. Snoring was evaluated by preoperative and postoperative polysomnography at Department of Psychophysiology, Vrapče Psychiatric Hospital, Zagreb. Results were analyzed using Wilcoxon test. Postoperative reduction of snoring was statistically significant (P=0.00052). Snoring index was decreased in 83% of patients, yielding a mean reduction of 83%. In 50% of patients, reduction of snoring index was over 95%. These results confirm the high efficiency of the procedure in the treatment of patients suffering from snoring.

Key words: *Sleep apnea, obstructive – surgery; Snoring – surgery; Polysomnography; Pharynx – surgery; Palate – surgery; Uvula – surgery; Radiofrequency-assisted uvulopalatopharyngoplasty**

Introduction

The aim of this study was to evaluate the efficiency of radiofrequency assisted uvulopalatopharyngoplasty (RAUPPP) in the treatment of snoring by comparing polysomnography (PSG) and snoring index values before and after surgical treatment.

Snoring is an acoustic phenomenon, which is a consequence of soft tissue vibrations caused by partial obstruction of the upper airway while sleeping. Anatomically changed soft tissue from the choana to the epiglottis is the cause of partial obstruction[1]. Comparing to primary snoring, in which only acoustic phenomena are observed, secondary snoring is considered as part of the obstructive sleep apnea syndrome (OSAS). Besides snoring, episodes of apnea or/and hypoventilation during sleep are observed in OSAS. Considering disease dynamics, primary snoring can be an early predictive sign of developing OSAS. The possibility for such an outcome is higher if the patient is aged 35-40 or/and has gained weight[2].

It is estimated that 20% of men and 5% of women between 30 and 35 years of age snore and this rate increases to 50% of men and 30% of women over 60 years of age[3,4].

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Risk factors for snoring are male gender, older age, obesity, abuse of alcohol and sedatives, and smoking[5]. Prolonged, floppy soft palate, pharyngeal masses, nasal breathing disorders and low muscle tonus are supposed to be stimulating factors as well.

Methods of treatment are conservative and surgical. Dietetic measures, antidepressant drugs and continuous nasal positive airway pressure (nCPAP) are conservative techniques, which demand life-long compliance, so patients often want transfer to surgical treatment[6,7]. Several surgical techniques are widely used in the treatment of snoring, e.g., uvulopalatopharyngoplasty (UPPP), radiofrequency uvuloplasty (RFUPP), laser-assisted uvulopalatopharyngoplasty (LAUPP), RAUPPP, radiofrequency tongue base reduction (RTBR), medial glossectomy, and others[8-10].

Subjects and Methods

Data from medical charts of 22 patients (men 87%) treated for OSAS at University Department of ENT, Head and Neck Surgery, Sestre milosrdnice University Hospital Center, Zagreb, during 2008 and 2009 were collected, analyzed and included in this study. Data were obtained and used in accordance with ethical standards approved by the institution ethics committee. Patients were informed on their data confidentiality when used in medical research and they gave their written consent.

Patient age ranged from 28 to 67 years, mean age 43.09±9.6 years. Snoring was evaluated by preoperative and postoperative polysomnography (PSG) at Department of Psychophysiology, Vrapče Psychiatric Hospital, Zagreb. The mean time elapsed from surgical treatment to follow up PSG was 210 (range, 35-457) days.

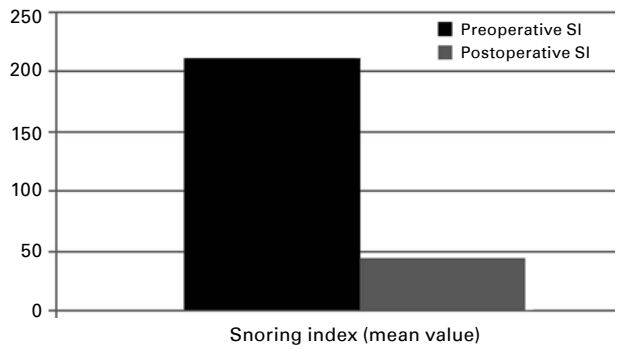
The level of snoring was evaluated by use of snoring index and was measured during PSG study. PSG is a noninvasive method used to diagnose sleep disorders. All study patients underwent one-night PSG study. It included electroencephalography (EEG) and electrocardiography (ECG). Respiration was measured by thoracic and abdominal movements, and hemoglobin saturation by pulse oximetry. Since patients had OSAS, apnea index (AI), apnea-hypopnea index (AHI) and desaturation index were measured. AI was defined as the number of airflow absence for more than 10 seconds *per* hour and AHI as the number of airflow decrease by 30% or more *per* hour plus AI. Desaturation index was defined as the number of drops greater than 5% in SpO_2 from baseline value *per* hour. Snoring index was defined as the number of episodes of snoring during one-hour sleep. According to loudness, it is qualified as very loud, loud or quiet snoring.

During the treatment, the patients underwent RAUPPP. It is a modification of Fujita's UPPP in which the RF bipolar system (Olympus-Celon pro cut) was used in combination with a classical operation technique. The procedure includes tonsillectomy, resection of the soft palate and uvula with creation of a neo-uvula and suture of tonsilar pillars (anterior to posterior pillar) and tonsillar lodge closing in layers, for which lateral pharyngeal folds are used in case of hypertrophy.

Results were analyzed by Wilcoxon test using the Statistica for Windows software. *P* value less than 0.05 was considered statistically significant.

Results

Twenty-two subjects with OSAS who underwent RAUPPP were included in the analysis. The male to female ratio was 19:3; age range 28-67 (mean ± SD 43.09±9.6) years; mean body mass index (BMI) 27.6±3.8 kg/m^2; and mean preoperative snoring index 211.3±148.9. Postoperative PSG was done at 210 days of surgical procedure on an average. The mean postoperative value of snoring index was 43.8±71.3,



After radiofrequency assisted uvulopalatopharyngoplasty, the snoring index (SI; snoring episodes per hour) dropped statistically significantly (P=0.00052) from 211.3 preoperatively to 43.8 postoperatively (black = preoperative value, gray = postoperative value).

Fig. 1. Mean value of preoperative and postoperative snoring index.

Table 1. Percent of patients and percent of snoring index (SI) reduction (or increase) following radiofrequency assisted uvulopalatopharyngoplasty

Snoring Indeks (SI)	Patients (%)
100% reduced SI	11
99-100% reduced SI	28
95-99% reduced SI	11
80-95% reduced SI	11
60-80% reduced SI	5
40-60% reduced SI	11
30-40% reduced SI	5
Increase SI	17

In total 50% of patients showed more than 95% reduction of snoring and other 27% showed between 40 and 95% of snoring reduction. 5 % had between 30 and 40% snoring reduction. In total 82% of patient had postoperative snoring improve.

yielding a statistically significant difference from its preoperative value (P=0.00052) (Fig. 1).

Study patients did not suffer from primary snoring; they all had OSAS (the mean preoperative AHI, 31.3±18.2).

Snoring index was reduced in 83% of patients, yielding a mean reduction by 83% (median 98%, range 40%-100%). In 50% of patients, the reduction of snoring index exceeded 95% (Table 1).

Discussion

This study evaluated RAUPPP as a method of treatment for snoring. The results showed it to be highly effective. Snoring index was reduced in 83% of study patients, with 83% mean reduction. Snoring should be treated as a significant medical issue for its high prevalence (50% of men above 60 years of age) and a great number of complications. Considering that people living with snorers are also affected by snoring, this disease gets even greater significance[4]. Also, heavy snorers have a higher risk of developing hypertension and angina pectoris compared to non-snorers of the same age and weight[9,10].

There are numerous techniques in the treatment of snoring and beside efficiency of surgical technique, other parameters need to be considered (operation time, complications, type of anesthesia, postoperative pain). From 1981, the Fujita's operation (classical UPPP) was considered to be the best method in the treatment of snoring[11]. Ever since then, lots of innovations have been introduced in surgery with the aim to find a minimally invasive, practicable, safe and efficient method in the treatment of snoring[4]. Institution of radiofrequency energy in the operation is believed to be the next step in the achievement of this goal[12].

Efficiency of different techniques varies in different studies. Efficiency of Fujita's operation varies from 42% to 78%, while RFUPP is effective in 65% to 86% of patients[13-15]. LAUPP is as effective as RFUPP, however, the level of postoperative pain and the rate of complications are lower [2,14.] To our best knowledge, there is just one study on the efficiency of RAUPPP in the treatment of snoring; according to that study, the efficiency of RAUPPP is 75%[15].

Concerning the level of postoperative pain, it is higher in more invasive procedures such as UPPP and RAUPPP as compared to less aggressive LAUPP and RFUPP.

Side effects and complications of the operation are globus sensations, velopharyngeal insufficiency, pain and swallowing difficulties. The most dominant side effect is pain, and it commonly lasts for 10 days, as well as transitory velopharyngeal insufficiency[16]. The technique has been even more improved with a new modification of the operation called mRFUPP, which has the same level of efficiency with lower level of postoperative pain[17].

Conclusion

The data obtained in the present study support a prior report that radiofrequency energy can be used in the treatment of snoring. The improvements in patient snoring were similar to or even better than the results reported with other techniques. This is a new technique, so evaluation of the benefits and risks will become known with time. For optimal results, different methods of treatment of snoring need to be combined according to the disease severity and patient characteristics.

References

1. HOFFSTEIN V, MATEIKA JH, MATEIKA S. Snoring and sleep architecture. Am Rev Resp Dis 1991;143:92-6.
2. DEA LJ, SUNG HK, BO HK. Treatment of primary snoring using radiofrequency-assisted uvuloplasty. Eur Arch Otorhinolaryngol 2007;264:761-7

3. KOSKENVO M, PARTINEN M, SARNAS S. Snoring as a risk factor for hypertension and angina pectoris. Lancet 1985;20:893-6.
4. IKEMATSU T. Study of snoring, 4th report. J Jpn Oto Rhino Laryngol 1964;64:434-5.
5. OZGUR Y, METIN A, YAVUZ S. Treatment of primary snoring using modified radiofrequency-assisted uvuloplasty. Eur Arch Otorhinolaryngol 2009;266:1807-14.
6. BUMBER Ž, KATIĆ V, NIKŠIĆ M. Otorinolaringologija. Zagreb: Naklada Ljevak, 2004;193-5.
7. WALKER RP. Snoring and obstructive sleep apnea. In: BAILEY BJ, CALHOUN KH, editors. Head and neck surgery: otorhinolaryngology. 2nd ed. Philadelphia, Pa: Lippincot-Raven, 1998;707-29.
8. PICCIRILLO JF, THAWLEY SE. Sleep-disordered breathing. In: CUMMINGS CW, editor. Otorhinolaryngology; head and neck surgery. 3rd ed. St. Louis: Mosby, 1998;1546-71.
9. LUGARESI E, CIRIGNOTA F, COCCAGNA G, BARUZZI A. Snoring and obstructive apnea syndrome. Electroencephalogr Clin Neurophysiol Suppl 1982;35:421-30.
10. KOSKENVO M, PARTINEN M, SARNAS S. Snoring as a risk factor for hypertension and angina pectoris. Lancet 1985;20:893-6.
11. FUJITA S, CONWAY WA, ZORICK FJ, ROTH T. Surgical correction of anatomic abnormalities in obstructive sleep apnea syndrome: uvulopharyngoplasty. Otolaryngol Head Neck Surg 1981;89:923-34.
12. POWELL N, RILEY R, TROELL R. Radiofrequency volumetric reduction of the tongue: a porcine pilot study for treatment of obstructive sleep apnea. Chest 1997;111:1348-55.
13. BERNECKER F, STASCHE N, HÖRMANN K. Snoring and sleep apnea syndrome: surgical treatment and MESAM-IV controlled, postoperative results. Laryngologie 1993;72:398-401.
14. OSMAN EZ, OSBORNE J, HILL PD. The Epworth Sleepiness Scale: can it be used for sleep apnea screening among snorers? Clin Otolaryngol Allied Sci 1999;24:239-41.
15. BASSIOUNY A, SALAMAWY A, El-TAEAB M. Bipolar radiofrequency treatment for snoring with mild to moderate sleep apnea: a comparative study between the radiofrequency assisted uvuloplasty technique and the channeling technique. Eur Arch Otorhinolaryngol 2007;264:659-67.
16. ŠIMUNJAK B, IVKIĆ M, GLOBLEK D, VAGIĆ D. *Follow up* nakon tri načina kirurške terapije poremećaja disanja u snu. Book of Abstracts, 5th Croatian ENT Congress, Osijek, May 2-5, 2007.
17. CHUNG JW, ENCISIO R, LEVENDOWSKI DJ, WESTBROOK PR, CLARK GT. Patients with positional *versus* nonpositional obstructive sleep apnea: a retrospective study of risk factors associated with apnea-hypopnea severity. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;110:605-10.

Sažetak

USPJEŠNOST RADIOFREKVENCIJOM POTPOMOGNUTE UVULOPALATOFARINGOPLASTIKE U LIJEČENJU HRKANJA

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Hrkanje je akustična pojava koja se javlja tijekom sna u bolesnika sa sindromom opstruktivne apneje u snu kao posljedica vibracija zraka zbog prolaza kroz mekim tkivima suženi gornji dišni put. Procjenjuje se da oko 20% muškaraca i oko 5% žena u dobi 30 do 35 godina hrče, a taj postotak raste na 50% muškaraca i oko 30% žena u dobi iznad 60 godina. Cilj ovoga rada bio je ocijeniti uspješnost radiofrekvencijom potpomognute uvulopalatofaringoplastike u liječenju hrkanja pomoću vrijednosti polisomnografskog testiranja prije i poslije operacijskog zahvata. U ispitivanje su bila uključena 22 pacijenta liječena zbog ovoga sindroma na Klinici za ORL i kirurgiju glave i vrata KBC "Sestre milosrdnice" u Zagrebu tijekom 2008. i 2009. godine. U skupini ispitanika bilo je 87% muškaraca i 13% žena dobnog raspona od 28 do 76 godina, srednja dob 43,09±9,6 godina. Hrkanje se ocjenjivalo prije i poslije operacije polisomnografijom na Klinici za neurofiziologiju spavanja Psihijatrijske bolnice Vrapče. Rezultati su statistički analizirani Wilcoxoniovim testom. Poslijeoperacijsko smanjenje hrkanja bilo je statistički značajno (P=0,00052). Indeks hrkanja je smanjen kod 83% ispitanika, a prosječno smanjenje iznosilo je 83%. Kod 50% pacijenata smanjenje indeksa hrkanja bilo je još veće i iznosilo je preko 95%. Ovi rezultati potvrđuju visoku učinkovitost ovoga zahvata u liječenju pacijenata koji hrču.

Ključne riječi: *Apneja u snu – kirurgija; Hrkanje – kirurgija; Polisomnografija; Ždrijelo – kirurgija; Nepce – kirurgija; Uvula – kirurgija; Uvulopalatofaringoplastika, radiofrekvencijska**